SPECTROSCOPIA MOLECULAR

Un bulletin mensual de novas e informationes de interesse e valor al spectroscopistas molecular

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LE STRUCTURA DE TRIFLUOROSILANO EX LE SPECTROS MICROUNDIC

(Summario de un articulo submittite al Transactions of the Faraday Society. Recipite le 18 de martio 1954.)

MESURATIONES de frequentia super le transitiones purirotational de trifluorosilano ha essite extendite al transitiones J = 1 → 2, 2 → 3, e 3 → 4 de F_3SiD e J = 2 → 3 e 4 → 5 de F_3SiH. Le valores computate pro B_o es:

$F_3{}^{28}SiD$ 6.890,08 ± 0,05 Mc/sec,

$F_3{}^{29}SiD$ 6.880,15 ± 0,08 Mc/sec,

e

$F_3{}^{30}SiD$ 6.870,53 ± 0,1 Mc/sec.

Le coefficientes de distortion D_J pro $F_3{}^{28}SiH$ e $F_3{}^{28}SiD$ es circa 5 e 4 kc/sec, respectivemente.

Ex considerationes de varie combinationes del datos pro le moleculas isotope (le effectos del energia al puncto zero essente neligite), le dimensiones molecular es calculate como:

$$d_{SiH} = 1{,}455 \pm 0{,}01 \text{ A},$$

$$d_{SiF} = 1{,}565 \pm 0{,}005 \text{ A},$$

e

$$\angle F\text{-}Si\text{-}F = 108^\circ\ 17' \pm 30'.$$

Le influentia del effectos del energia al puncto-zero super le parametros d_{SiH} e d_{SiD} es brevemente considerate.

G. A. HEATH,
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Universitate Birmingham
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METHANOS SUBSTITUITE. XX. CONSTANTES DE ENERGIA POTENTIAL E PROPRIETATES THERMODYNAMIC CALCULATE PRO ALICUN DIBROMOMETHANOS

(Summario de un articulo submittite al J. Chem. Phys. le 23 de februario 1954.)

LE numeros de undas correspondente al fundamentales es:

Typo	CH_2Br_2	CD_2Br_2	Typo	$^aCHDBr_2$
a_1	174	175	a'	176.5
a_1	576	548	a'	556
a_1	1388	1023	a'	1236
a_1	2988	2195	a'	2214
b_1	3061	2235	a'	3023
b_1	810[b]	636[a]	a'	701
b_2	1183	877[a]	a"	1145
b_2	637	609	a"	621
a_2	1091	773[a]	a"	821

Le unitates es K (kayser o cm^{-1}). Le valores designate per le superscriptos a

(continuate a pagina 27)

LE fontes de omne fructuose activitate human se nutri ab le ideas de alicun rar homines e feminas talentose. Per virtute precisemente de lor originalitate illos non se conforma a patronos standard, e constringer les es destruer les. Il es le ver objectivo de un universitate, provider un sanctuario pro tal homines e feminas, incoragiar lor individualitate, e offerer a illes le medios pro satisfacer le fortias que pulsa les. Le futuro de recerca fundamental essera governate per le sagacitate e habilitate con le quales le universitates realisa iste objectivo.

-- J. A. STRATTON, Chem. and Eng. News 31, 2583 (1953).

TRACTAMENTOS DEL COORDINATAS NORMAL DE MOLECULAS POLYATOMIC

Salvador M. Ferigle e Alfons Weber
Instituto Technologic de Illinois, Chicago 16, Illinois
(Continuate ab Spec. Mol. 3, 21 (1954))

3.32 Calculation Del Vectores $\underline{s}$. In un previe section le consistentia del tractamento Wilson de vibrationes molecular con le conditiones Eckart esseva discutite. Il esseva monstrate illac que le vectores $\underline{s}$ debe satisfacer le duo equationes

$$\sum_n \underline{s}_n^{\,i} = 0 \qquad (33)$$

e

$$\sum_n \underline{r}_n^{\,o} \times \underline{s}_n^{\,i} = 0, \qquad (34)$$

ubi $\underline{s}^{\,i}$ es le vector $\underline{s}$ correspondente al atomo n e al coordinata interne i, e ubi $\underline{r}_n^{\,o}$ es le vector de position del atomo n con respecto al centro de massa del molecula.

Il esseva etiam monstrate que le vectores $\underline{s}$ pote esser exprimite como gradientes de functiones scalari appropriatemente seligite del vectores de position del N atomos que forma le molecula polyatomic.

In iste section, le conditiones (33) e (34), tanto como le geometria del systema appropriate, essera usate pro derivar le vectores $\underline{s}$ pro le quatro typos principal del coordinatas interne. Illos es: tension del ligamine, flexion interligaminic, torsion del ligamine, e flexion extra le plano, omne le quales ha essite describite in detalio per Decius[12]. In iste derivation, nos sequera un articulo recente per Malhiot e Ferigle[17].

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[17] R. J. Malhiot e S. M. Ferigle, J. Chem. Phys. 22, (1954).

Lassa nos definir le position del atomo n per un vector $\underline{r}_n$ si que

$$\underline{r}_n^{\,o} = \underline{R} + \underline{r}_n$$

ubi $\underline{R}$ es le vector de position de un nove origine arbitrari con respecto al centro de massa. Nos ha tunc ex Eq. 34

$$\underline{R} \times \sum_n \underline{s}_n^{\,i} + \sum_n \underline{r}_n \times \underline{s}_n^{\,i} = 0.$$

Sed le prime termino es zero per virtute de Eq. 33: assi, nos nunc ha un forma plus general de Eq. 34, i. e.

$$\sum_n \underline{r}_n \times \underline{s}_n^{\,i} = 0. \qquad (38)$$

Ben que alicun del symbolos que va esser usate per nos esseva previemente definite (vide section 3.0), illos es explicitemente definite infra pro evitar confusion e etiam proque alicun nove symbolos -- associate al torsion de ligamine e flexion extra le plano -- debe esser introducite. Le sequente nomenclatura essera usate:

Q_{ij} : Le reciproco del distantia de equilibrio inter le atomos i e j;

q_{ij} : Le cambiamento in le distantia de ligamine inter le atomos i e j ab le position de equilibrio;

$\phi_{jk}^{\,i}$: Le valor de equilibrio del angulo con le atomo i al apice e le atomos j e k al terminos;

$\delta_{jk}^{\,i}$: Le cambiamento in le angulo interligaminic ab le valor de equilibrio;

$T_{jk}^{\,il}$: Le valor de equilibrio del angulo dehedre inter le planos i-j-k e j-k-l;

$\tau_{jk}^{\,il}$: Le cambiamento in le angulo dihedre inter le planos i-j-k e j-k-l ab le position de equilibrio;

$\Gamma_{ijk}^{\,l}$: Le valor de equilibrio del angulo inter le ligamine k-l e le plano i-j-k;

$\gamma_{ijk}^{\,l}$: Le cambiamento in le angulo inter le ligamine k-l e le plano i-j-k ab le position de equilibrio;

$\underline{e}_{ij}$: Un vector unitari secundo le ligamine i-j de equilibrio ab le atomo i al atomo j;

$\underline{f}_{jk}^{\,i}$: Un vector unitari in le plano i-j-k, perpendicular al ligamine de equilibrio i-j e derigite al atomo k;

$\underline{h}_{ijk}^{\,l}$: Un vector unitari perpendicular al plano de equilibrio i-j-k, e derigite al atomo l.

3.321 Tension Del Ligamine. Le function scalari correspondente a un cambiamento in le longitude del ligamine inter le atomos i e j es simplemente

$$f = |\underline{r}_i - \underline{r}_j| .$$

Ergo

$$\underline{s}(q_{ij};i) = \partial/\partial \underline{r}_i^{\,o} \, |\underline{r}_i^{\,o} - \underline{r}_j^{\,o}|$$

$$= (\underline{r}_i^{\,o} - \underline{r}_j^{\,o})/|\underline{r}_i^{\,o} - \underline{r}_j^{\,o}| = -\underline{e}_{ij}. \quad (39)$$

Ex Eq. 33,

$$\underline{s}(q_{ij};j) = -\underline{s}(q_{ij};i) = \underline{e}_{ij}. \quad (40)$$

Eqs. 39 e 40 es le vectores $\underline{s}$ pro un coordinata de tension como date per Wilson.[1]

3.322 Flexion Interligaminic. Usante le proprietates de gradiente del vector $\underline{s}$, nos nota que le direction de cambiamento maximal del angulo interligaminic pro un displaciamento arbitrari $\underline{d}_j$ del atomo j es simplemente $-\underline{f}_{jk}^{\,i}$. Le magnitude de $\underline{d}_j$ in iste direction es $-\underline{d}_j \cdot \underline{f}_{jk}^{\,i}$; ergo, le magnitude del cambiamento in le angulo interligaminic associate con $\underline{d}_j$ es $-\underline{d}_j \cdot \underline{f}_{jk}^{\,i} Q_{ij}$. Le vector $\underline{s}$ tunc es

$$\underline{s}(\phi_{jk}^{\,i};j) = -Q_{ij} \underline{f}_{jk}^{\,i} \quad (41)$$

Similarmente,

$$\underline{s}(\phi_{jk}^{\,i};k) = -Q_{ik} \underline{f}_{kj}^{\,i}. \quad (42)$$

Ex Eq. 33,

$$\underline{s}(\phi_{jk}^{\,i};i) = Q_{ij} \underline{f}_{jk}^{\,i} + Q_{ik} \underline{f}_{kj}^{\,i}. \quad (43)$$

Quando le atomos i, j, e k non es collinear, on obtene

$$\underline{f}_{jk}^{\,i} = \operatorname{cosec} \phi_{jk}^{\,i} (\underline{e}_{ik} - \underline{e}_{ij} \cos \phi_{jk}^{\,i}),$$

e un simile expression pro $\underline{f}_{kj}^{\,i}$ obtenite per intercambiar le indices. Iste duo expressiones etiam esseva date per Eliashevich.[13]

Per le substitution de iste expressiones pro le vectores $\underline{f}$ in Eqs. 41-43, nos pote obtener le vectores $\underline{s}$ correspondente al coordinatas de flexion que esseva date per Wilson[1]. Pro le caso de moleculas linear, le supra-date expressiones pro $\underline{f}$ non es valide. Iste caso ha essite discutite alibi.[7]

(Va continuar in un numero futur)

METHANOS SUBSTITUITE (continuate ab p.25)

es calculate, non observate. Le valor designate per le subscripto b es pro le stato gasose, le alteres pro le stato liquide.

Le constantes diagonal del energia potential es:

f_h	f_b	f_{bb}	f_{bh}	f_{hh}
5,0455 md/A	2,8965 md/A	1,0868 md A / rad^2	0,59500 md A / rad^2	0,61688 md A / rad^2

Hic h = C-H, b = C-Br, bb = Br-C-Br, bh = Br-C-H, hh = H-C-H, md = millidynas, A = angstrom, e rad = radianc. Le valores de 17 constantes de interaction etiam es date.

Le contento caloric, energia libere, entropia, e capacitate caloric in calorias grado^{-1} mole^{-1} es:

CH_2Br_2

T (°K)	H/T	-F/T	S^o	C_p^o
100	8,40	50,02	58,41	9,21
200	9,22	56,08	65,30	10,98
273,16	9,89	59,06	68,96	12,57
298,16	10,14	59,93	70,08	13,11
300	10,16	60,00	70,16	13,15
400	11,16	63,06	74,22	15,11
500	12,12	65,65	77,77	16,68
600	12,98	67,94	80,92	17,92
700	13,76	70,00	83,76	18,92
800	14,46	71,88	86,34	19,75
900	15,09	73,62	88,71	20,45
1000	15,66	75,25	90,90	21,06

CD_2Br_2

100	8,40	50,35	58,75	9,24
200	9,37	56,45	65,83	11,69
273,16	10,29	59,51	69,80	13,85

T (°K)	H/T	-F/T	S^o	C_p^o
298,16	10,62	60,42	71,04	14,53
300	10,64	60,49	71,13	14,57
400	11,91	63,73	75,64	16,79
500	13,06	66,51	79,57	18,40
600	14,12	69,04	83,16	19,69
700	14,92	71,21	86,14	20,60
800	15,68	73,26	88,94	21,38
900	16,35	75,15	91,50	22,02
1000	16,94	76,89	93,84	22,54
$CHDBr_2$				
100	8,40	51,57	59,97	9,23
200	9,30	57,66	66,95	11,34
273,16	10,10	60,67	70,77	13,21
298,16	10,38	61,57	71,95	13,81
300	10,40	61,63	72,03	13,85
400	11,54	64,78	76,32	15,93
500	12,58	67,47	80,05	17,53
600	13,51	69,85	83,36	18,77
700	14,34	72,00	86,34	19,75
800	15,07	73,96	89,03	20,56
900	15,72	75,77	91,48	21,24
1000	16,30	77,45	93,75	21,80

$H = H^o - E_o^o$ e $F = F^o - E_o^o$. H = contento caloric, F = energia libere, S = entropia, e C = capacitate caloric.

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LIBRO

Instrumental Analysis. Per John H. Harley e Stephen E. Wiberley. John Wiley and Sons, Inc., 440 Fourth Ave., New York 16, N. Y.; Chapman and Hall, Ltd., London, 1954. 440 paginas, precio $6.50.

Iste libro explica le operation del instrumentos analytic principal e le uso de iste instrumentos in problemas de recerca. Discutite es spectroscopia absorptionic, emissionic, Raman, e echelle; photometria de flammas; methodos de titration a alte frequentias; analyse per radios X; spectrometria massic; e mesurationes de radiation nucleari.

Le methodo de tractamento es:
1) Un discussion del theoria,
2) un examine del componentes de cata instrumento,
3)un consideration de varie instrumentos commercial, e
4)proceduras e applicationes typic.

Le limitationes tanto como le avantages del methodos e instrumentos es considerate.

RECIPITE

Bibliography of Translations from Russian Scientific and Technical Literature. Lista No. 5, februario 1954. Card Division, Library of Congress, Washington, D.C. $0,25 per mense, $3.00 per anno.

On the Effect of the Hydrogen Bond on Raman Spectrum. A. I. Stekhanov, Doklady Akademii Nauk SSSR 92, 281-84 (1953). NSF-tr-189.

The Magnitude of the Optical Anisotropy of the Benzene and Carbon Disulfide Molecules as Determined by Light Scattering in Solutions. M. F. Vuks e V.I. Yelfimov, Doklady Akademii Nauk SSSR, 92, 29-32 (1953). NSF-tr-175.

Traductiones in anglese de iste duo articulos es disponibile ab le Office of Technical Services, Department of Commerce, Washington 25, D.C. a un precio de 10 cents per cata un.

Instrument News, Vol.5, No.2, 1-8 (1954). Corporation Perkin-Elmer, Norwalk, Conn., Statos Unite. Paul A. Wilks, Redactor. Gratis.

Iste numero contine un articulo per Leo Levi e Charles E. Hubley super le characterisation de barbituratos per spectroscopia infrarubie. Etiam, le establimento de un nove bureau de servicio de iste corporation a 230 N. Michigan Ave. in Chicago es annunciate.

Spectrographer's News Letter. Vol.V, No. 1, 1-3 (1954). Applied Research Laboratories, Glendale 5, California, Statos Unite. Gratis.

Discutite es un nove quantometro a duo metros pro le controlo de production, e un pressa pro le production de briquettes de KBr -- continente un specimen solide -- pro uso in le analyse infrarubie. (Vide etiam Spec. Mol. 2, 27 (1953).

The Bulletin, Vol.5, No.1, 1-3 (1954). The Anderson Physical Laboratory, 609 S. Sixth St., Champaign, Illinois, Statos Unite. Gratis.

Iste numero contine un articulo super le influentia del stato physic al spectro infrarubie.

NOVE BUREAU EUROPEE

Beckman Instruments, Inc., ha establite un branca europee. Le adresse es Elektron Instrumente G. m. b. H. Grobenzellerstrasse 13, Munich-Pucheim, Germania. Le chef del nove division international es Robert T. Jones, Beckman Instruments, Inc., Fullerton, California, Statos Unite.

ALICUN ARTICULOS RECENTE

Analyse Chimic per Infrarubio. Bryce Crawford, Scientific American 189, 42-48 (1953). Universitate Minnesota, Minneapolis, Minn., Statos Unite.

Isto es un ben illustrate articulo elementari.

Effecto Raman in Solidos. A. C. Menzies, Reports on Progress in Physics XVI, 83-107 (1953). Hilger and Watts, London.

Un tractamento theoric de vibrationes in crystallos, specialmente pro le haloides de alcalis. Multe referentias es date.

Spectrophotometria Ultraviolette ab le Puncto de Vista Instrumental. J. van Dranen, Chemisch Weekblad 49, 482-491 (1953). Universitate Amsterdam, Hollanda.

Un discussion specialmente del spectrophotometros photoelectric Beckman e Unicam.

Le Problema de Intensitates in le Effecto Raman. O. Theimer, Acta Physica Austriaca VII, 216-238 (1953). Physikaliches Institut, Technische Hochschule, Graz, Austria.

Un revista del posibilitates de application e le limitationes del theoria de polarisabilitate linear, e le connexion de illo con le problema de intensitates.

Le Spectro Raman e le Structura del Chlorido de Thionyl. C. A. McDowell, Trans. Faraday Soc. 49, 371-374 (1953). Universitate, Liverpool, Anglaterra.

Le spectro Raman, includente le grados de polarisation, ha essite mesurate pro $SOCl_2$ in le stato liquide. Le lineas a 194, 344, 489, e 1230 K esseva polarisate, durante que le altere duo lineas a 283 e 442 esseva dispolarisate. Isto indica que le molecula es pyramidal con le symmetria C_s, in concordantia con le resultatos de diffraction electronic. Proprietates thermodynamic esseva calculate pro nove temperaturas ab 291,15 a 1000,0 °K.

Comprende vos Interlingua? Kenneth M. Reese, Ind. and Eng. Chem., Martio 1954, paginas 11A-13A. 86 East Randolph Street, Chicago 1, Illinois.

Isto es un interessante articulo re le natura, historia, e presente usos de Interlingua per le redactor assistente de iste jornal. Le pictura monstra un machina de destruction vigorosemente attaccante le barriera de lingua international. Super le machine es scribite: "Interlingua Wrecking Co." (Compania de Destruction Interlingua). Mentionate in le articulo es Spectroscopia Molecular, Scientia International, e altere publicationes que nunc usa Interlingua.

Spectros Vibrational de Tetrafluoroethyleno e Tetrachloroethyleno. D. E. Mann, N. Acquista, e E. K. Plyler, J. Research Natl. Bur. Standards 52, 67-72 (1954). Washington, D. C.

Le spectros infrarubie de $F_2C{=}CF_2$ gasose ab 22 a 52 μ e de $Cl_2C{=}CCl_2$ liquide ab 3 a 52 μ ha essite obtenite. Nove assignationes satisfacente es facite, e proprietates thermodynamic calculate es date. 38 referentias es listate.

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CALENDARIO DE EVENTOS SPECTROSCOPIC

Maio 27-28. 9ne convocation annual del Society for Applied Spectroscopy, Hotel New Yorker, New York, N. Y. Thema: Frontieras de Spectroscopia. (P. A. Lighty, Federal Communications Laboratory, 500 Washington Street, Nutley, New Jersey, Statos Unite.)

Junio 14-18. 12de Symposio Annual super Spectroscopia e Structura Molecular, Universitate Ohio State. (H. H. Nielsen, Columbus 10, Ohio.)

Junio 23-25. 17me Congresso pro le Avantiamento de Methodos Spectrographic, Paris, Francia. (Secretariat, GAMS, 1, Place St. Thomas d'Aquin, Paris 7.)

Julio 1-3. Commission Juncte pro Spectroscopia, Lund, Sveda; e etiam in Lund,

Julio 1-7. Conferentia super Spectroscopia Atomic, in commemoration del nascentia de Rydberg. (P. F. A. Klinkenberg, Universitate Amsterdam, Muidergracht 4, Hollanda.)

Julio 12-23. Spectroscopia industrial moderne. Un programma designate specialmente pro chemistas e physicos ex industrias que es in le processo de installar equipamento spectrographic. (Prof. J. J. Devlin, Departimento de Physica, Collegio Boston, Chestnut Hill 67, Boston, Massachusetts, Statos Unite.

Julio 15-17. Symposio super Particulas Solide in Objectos Astronomic, Universitate Liége. (J. Duchesne, Liége, Belgica.)

Julio 19-30. Programma super spectroscopia infrarubie; instrumentation, methodos laboratorial, e solution de problemas chimic. Directores: Richard C. Lord e Foil A. Miller. (E. H. Huntress, Instituto Technologic de Massachusetts, Cambridge 39, Mass., Statos Unite.)

Augusto 30-September 3. 5te Colloquio International super Spectroscopia, Gmunden, in Austria Superior. Spectroscopia emissionic e molecular. Prof. F. X. Mayer, Chef. (J. R. Stansfield, Hilger and Watts, Ltd., 98 St. Pancras Way, London, N.W. 1, Anglaterra.)

September 3-7. Symposio International super Spectroscopia Infrarubie, Parma, Italia. Centenario de Macedonio Melloni (1798-1854). (G. Polvani, Via Saldini 50, Milano, Italia.)

SPECTROSCOPIA MOLECULAR es redigite e publicate mensualmente in interlingua per professor Forrest F. Cleveland del Laboratorio de Spectroscopia, Instituto Technologic de Illinois, Chicago 16, Illinois, Statos Unite. Manuscriptos in interlingua (o anglese) debe esser submittite a ille adresse.

Le texto original es legite per Dr. Alexander Gode, Chef del Division de Interlingua de Science Service (80 East 11th Street, New York 3, N. Y.). Libros importante super interlingua, disponibile ab ille adresse, es Interlingua-English Dictionary, Interlingua Grammar, e Interlingua A Prime Vista.

Labor editorial es gratis. Le costo de preparation e distribution es recipite ab le spectroscopistas, bibliothecas, e companias. Le directores de publication es senioretta Joyce Carol Broling e senior Fred L. Voelz.

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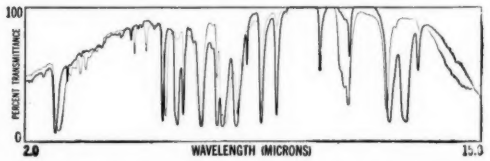

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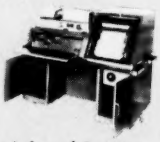

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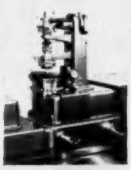


Write for Product Bulletin A-3 for more information about these accessories.

DOMESTIC SERVICE
Check the class of service desired; otherwise this message will be sent as a full rate telegram

FULL RATE TELEGRAM		SERIAL	
DAY LETTER		NIGHT LETTER	

WESTERN UNION

1206

W. P. MARSHALL, PRESIDENT

INTERNATIONAL SERVICE
Check the class of service desired; otherwise this message will be sent at the full rate

FULL RATE		LETTER TELEGRAM	
VICTORY LETTER		SHIP RADIOGRAM	

NO. WDS.-CL. OF SVC.	PD. OR COLL.	CASH NO.	CHARGE TO THE ACCOUNT OF	TIME FILED

Send the following message, subject to the terms on back hereof, which are hereby agreed to

Effective March 1, 1954

SPECIAL ATT'N: SPECTROSCOPY AND ANALYTICAL DEPTS.

SUBJECT: Spectrometer (IR) thermocouples

New low price.
New heights in sensitivity!

Now available: IR-2 Series, spectrometer thermocouples $260.00 each

Model 12, 12C, 112, 21, and 13 spectrometer thermocouples $210.00 each

Delivery: 24 hrs., Principal cities, USA

GUARANTEED MORE SENSITIVE - AN EXACT PHYSICAL REPLACEMENT!

Charles M. Reeder & Company

REEDER

BULLETIN NO. 54-A

CHARLES M. REEDER & COMPANY

173 Victor Avenue Detroit 3, Michigan

Telephone: TOwnsend 8-8348

Price: $ 260.00 each
f.o.b., Detroit

Delivery: 24 hrs. to
Principal cities, U. S. A.

IR-2 INFRARED SPECTROMETER thermocouples

GUARANTEED--The most sensitive ever employed in your spectrometer!

A PERFECT PHYSICAL FIT--no alterations necessary!

MORE SENSITIVE THROUGHOUT THE SPECTRUM!

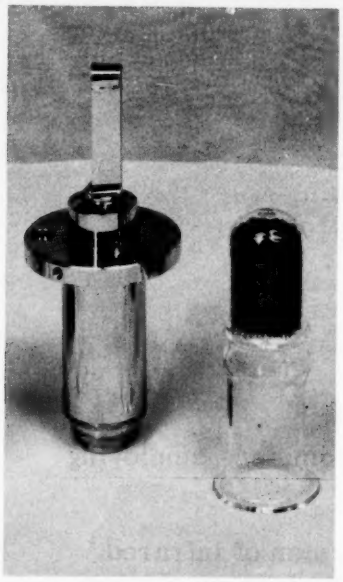
These fine, wire type, radiation thermocouples are a product of long research, developed for a high signal to noise ratio. Vacuum encased with the utmost consideration for long vacuum life. Black with tungsten-free gold black for best spectral response. Supplied with a lens window.

Receiver area:	2mm. by 0.3mm.
Sensitivity:	D. C. 6 microvolts per microwatt or better 10 c.p.s. 64% of D. C. Lowest noise level.
Window material:	KBr, CsBr
Vacuum warranty:	14 months-minimum
Our catalog No.:	RBK-22S
Price:	$ 260.00 each, f.o.b. Detroit for IR-2, IR-270 etc. spectrometers

Supplied with special solder for best coupling to amplifier.

For greater sensitivity
IR-3 Spectrometer thermocouples also available
SEE OUR 1954 CATALOG

CHARLES M. REEDER & COMPANY



Price: $ 210.00 each
f.o.b., Detroit

Delivery: 24 hrs. to
Principal cities, U. S. A.

INFRARED SPECTROMETER thermocouples
For spectrometer models: 12, 12C, 112, 21, and 13.

GUARANTEED--MOST SENSITIVE EVER employed in your spectrometer!
A PERFECT FIT--absolutely no alterations necessary! Complete with matching amplifier connector, ready to install.

The new low price is made possible by our quantity production resulting from the increased demand for our spectrometer thermocouples. A product of long research! Highly developed in every detail--for maximum working sensitivity, low noise, secure vacuum, and thorough ruggedness. The window can be polished without thermocouple dammage!

Receiver area:	2mm. by 0.2mm.
Sensitivity:	D. C. 8 microvolts per microwatt or better 13 c.p.s. 68% of D. C. Lowest noise level
Vacuum warranty:	14 months-minimum
Window material:	Choice of KBr, CsBr, or KRS-5.
Our catalog No.:	RP-3
Price:	$210.00 each, f.o.b. Detroit For the spectrometers listed above.

NOTE: If a Reeder thermocouple is accidently dammaged during installation it will be replaced without additional charge.

SPECIAL THERMOCOUPLES AVAILABLE

Thermopiles for spectrometers employing large optics.

Thermopiles for conversion of infrared recording spectrophotometers employing bolometers.

Ultra-violet thermopiles.

Far infrared thermopiles.

SEE OUR 1954 Catalog

CHARLES M. REEDER & COMPANY